Rotor: Bringing .NET to FreeBSD

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Outline

- Project Goals
- The License
- The ECMA standards work
- Rotor architecture
- Platform adaptation layer
- Base Class Library Selection

What is Rotor?

- Rotor is a reference implementation of the ECMA CLI and C# specs, plus key SDK tools, delivered as source under a license with generous terms for non-commercial purposes.
- It will build and run on Windows and FreeBSD

Why Are We Building Rotor?

- Key reason: support of proposed ECMA standard
  - Proof point for alternate platforms
  - Approachable "guide" for teachers, experimenters, and other commercial implementers
- ECMA standard relates compact framework, .NET framework, and third-party implementations
- Why bootstrap alternate CLI implementations?
  - Establish new runtime platform around web services
  - Interop will be a key to customer satisfaction
  - "Interop" is not "cross platform" (WORA is non-goal)

Shared Source CLI License

- Part of Microsoft's shared source framework
  - Multiple licenses offer flexibility and choice
  - Maintains the intellectual property rights needed to support strong software ecosystem
  - Adopts beneficial aspects of open source models, especially in the areas of source transparency and community
- One representative license will be for the shared source CLI, C#, and ECMAScript implementations:
  - Neither published nor final, but similar to published WinCE license
  - Feedback welcome!
- Goals of license design
  - Long-term investment of intellectual property into intellectual commons
  - Very liberal rights w.r.t. non-commercial derivatives, to increase educational access to seed the future
  - "Taintless" viewing of source when used as an implementation guide

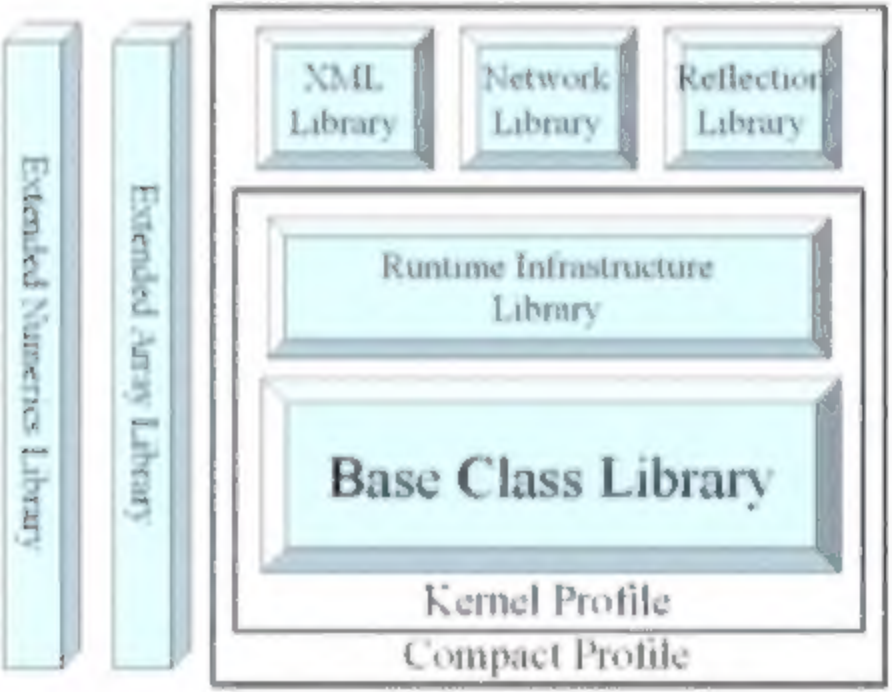
ECMA Submissions

- Partition I: Concepts and Architecture
  - Includes common type system
- Partition II: Metadata Definition and Semantics
  - Includes ilasm syntax, file format, PE and metadata
- Partition III: CIL Instruction Set
  - Includes instruction validation and verification rules
- Partition IV: Profiles and Libraries
  - Describes partitioning and common material
- Partition V: Annexes
  - Validation, verification, design guidelines, etc.
- C# Programming Language
  - Complete language specification, CLI is runtime for C#

Detail: Base Class Libraries

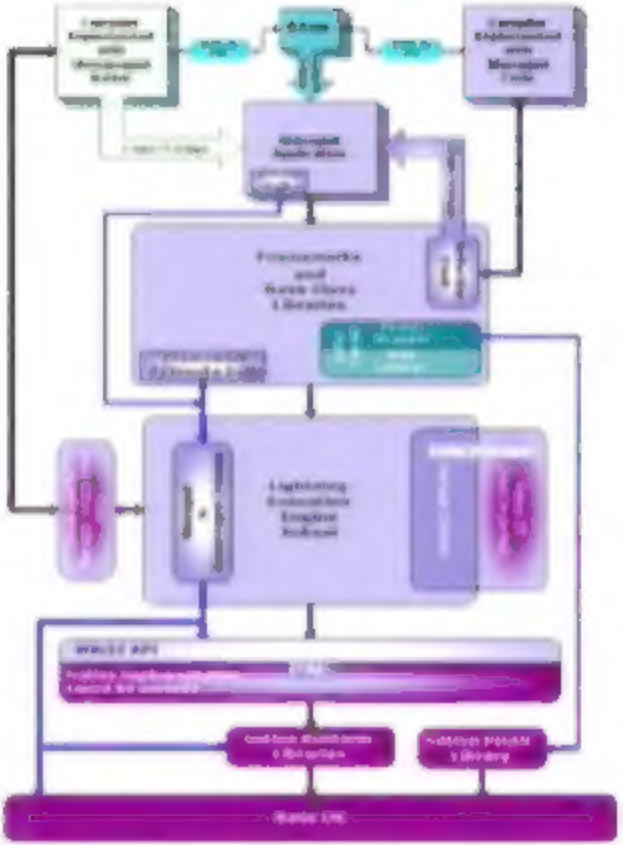
- Abstract OS Interface
  - Networking, Security, Standard I/O, Threading
- Common Programming Library
  - Common Data Types, Advanced Data Types, Collections, Extended Numerics, Regular Expressions, Serialization
- High-Level Programming
  - Asynchronous Programming, Globalization, Remoting, XML, Advanced XML
- EE Functionality
  - GC, Hosting, NonCLS, Reflection, Unmanaged
- Miscellaneous
  - Kernel, Basic Language Support, Development Time

Map of Libraries within Profiles



Interesting Rotor Components

- PAL
- Alternate JIT
- Simpler GC
- Hosting and calls into managed code
- Platform Independent GUI



PAL

- PAL implements platform support in a generic way
  - Boot loader
  - Threading support
  - Networking
  - Timers
  - File system
- PAL APIs preserve Win32 aspect but are chosen to facilitate porting to Unix platforms
  - Designed to minimize changes in DNoW code base
- PAL used by the
  - CLR
  - FX classes via P/Invoke
  - Unmanaged tools
- About 200 Win32 APIs will be implemented
  - Eliminating WinForms simplified it considerably

PIGUI Plan

- Many competing [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
- Many competing [illegible] libraries
  - [illegible]
    - [illegible] GTK+ vs KDE on top of Qt
    - [illegible]
  - [illegible]
    - [illegible]
    - Qt has licensing issues on Windows
    - GTK+ has ugly programming model and no Win32 option
    - Th[illegible] look and feel and [illegible] slow
- [illegible]
  - Fits with ubiquity goal
  - [illegible]

Rules for Cutting

- Started with everything in DNoW and then cut
  - Didn't build up from ECMA standards
- Cut criteria:
  - Remove trade secret or other sensitive IP
    - In most cases there are alternate low IP code bases
  - Remove Windows-specific functionality that can't feasibly be ported in v1
  - Remove features that are beyond the basics

Significant Cuts and Exceptions

- **COM interop cut**
  - [illegible] target platforms
  - Expensive cut [illegible]
- **Windows Forms cut**
  - Too dependent on [illegible] platform [illegible]
- **ASP.NET cut**
  - But System.Web.Services in R[illegible]
- **MS-specific areas of data classes cut**
  - [illegible]L server and OLE DB providers are cut
  - Other areas under investigation
- **VS.NET support cut**
  - No cross-dev scenario
  - [illegible]
  - All Designer classes cut
  - VB and [illegible] compiler will not be ported
  - But C# and JScript will be ported
- **Transparent loading and IJW support**
  - Rotor will not load [illegible] images
  - Users must use [illegible] to execute managed apps

Availability

- Q1/Q2 2002 for beta release
- Q3/Q4 2002 for final release
- Community build exercise around the release

Additional Resources

- Project Web site:
  http://rotor
- ECMA specs:
  http://msdn.microsoft.com/net/ecma
- Whitepaper and FAQ:
  http://www.microsoft.com/net/whitepapers.asp
- Microsoft commercial C# and CLR beta:
  http://msdn.microsoft.com/downloads
- Shared source info
  http://www.microsoft.com/sharedsource
  http://www.microsoft.com/windows/embedded/ce

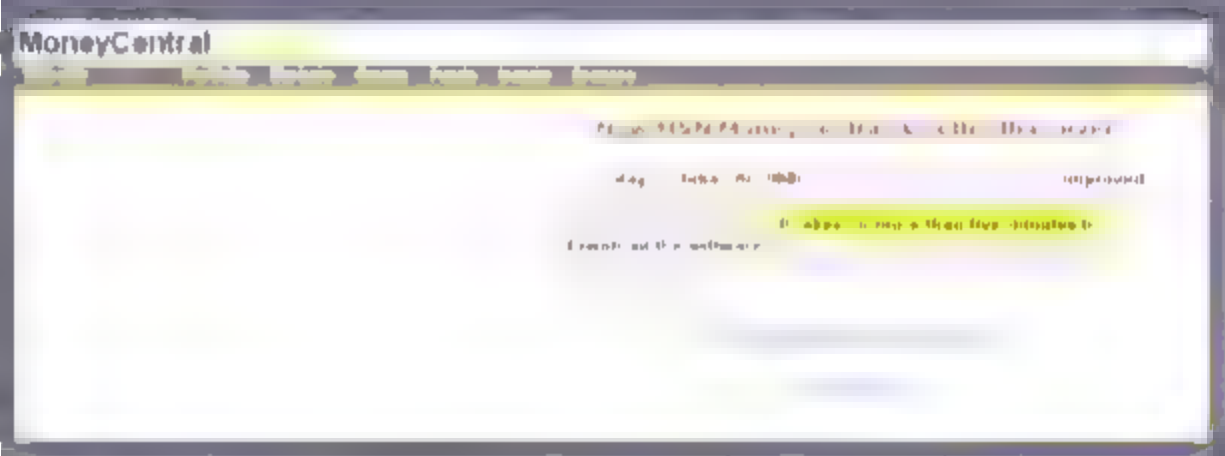
Questions?

Loader NET
Software On Demand

Hoi Vo

Agenda

Introduction



[illegible] challenges

- [illegible]
- [illegible]
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- [illegible]
- [illegible]
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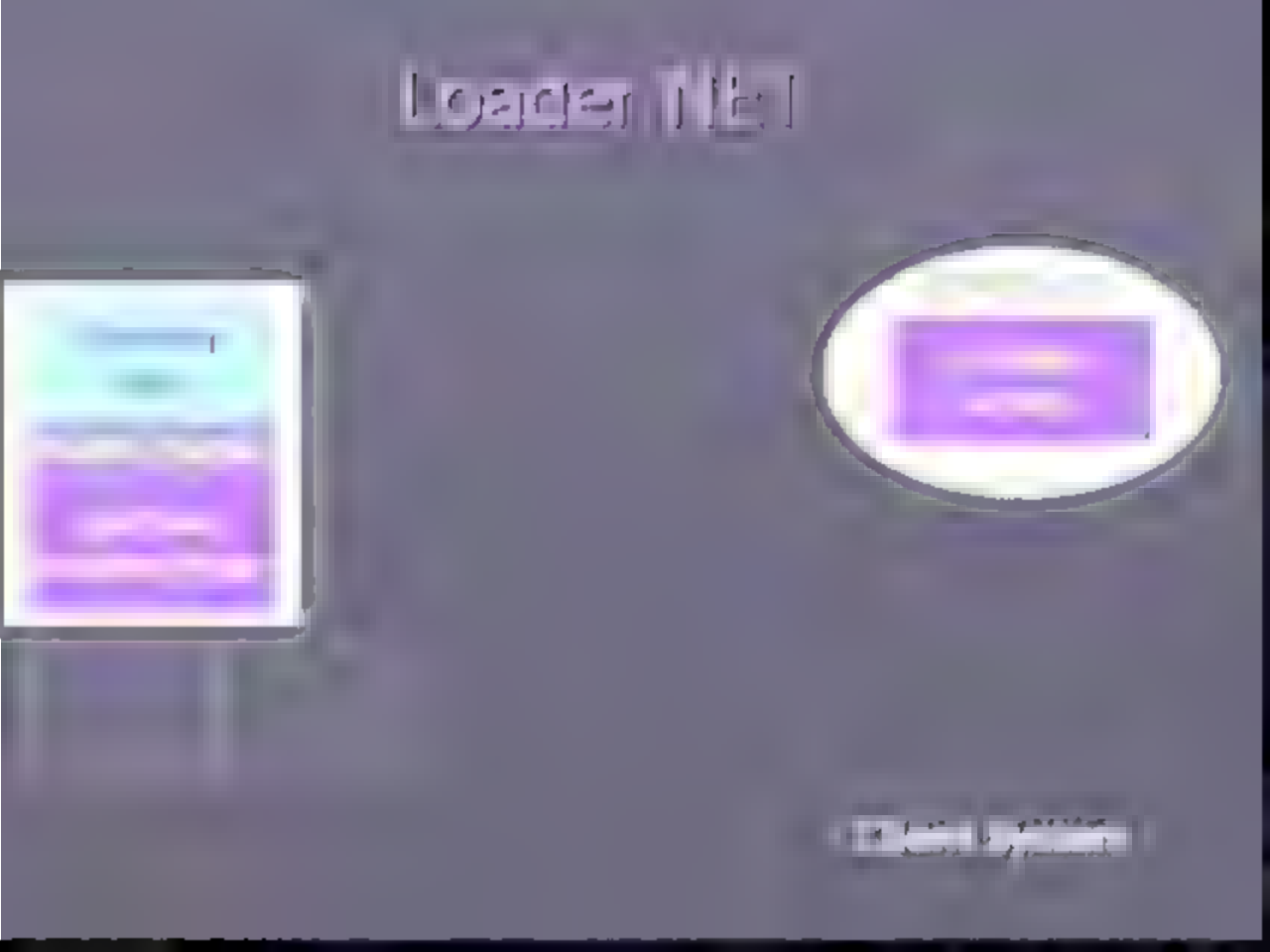
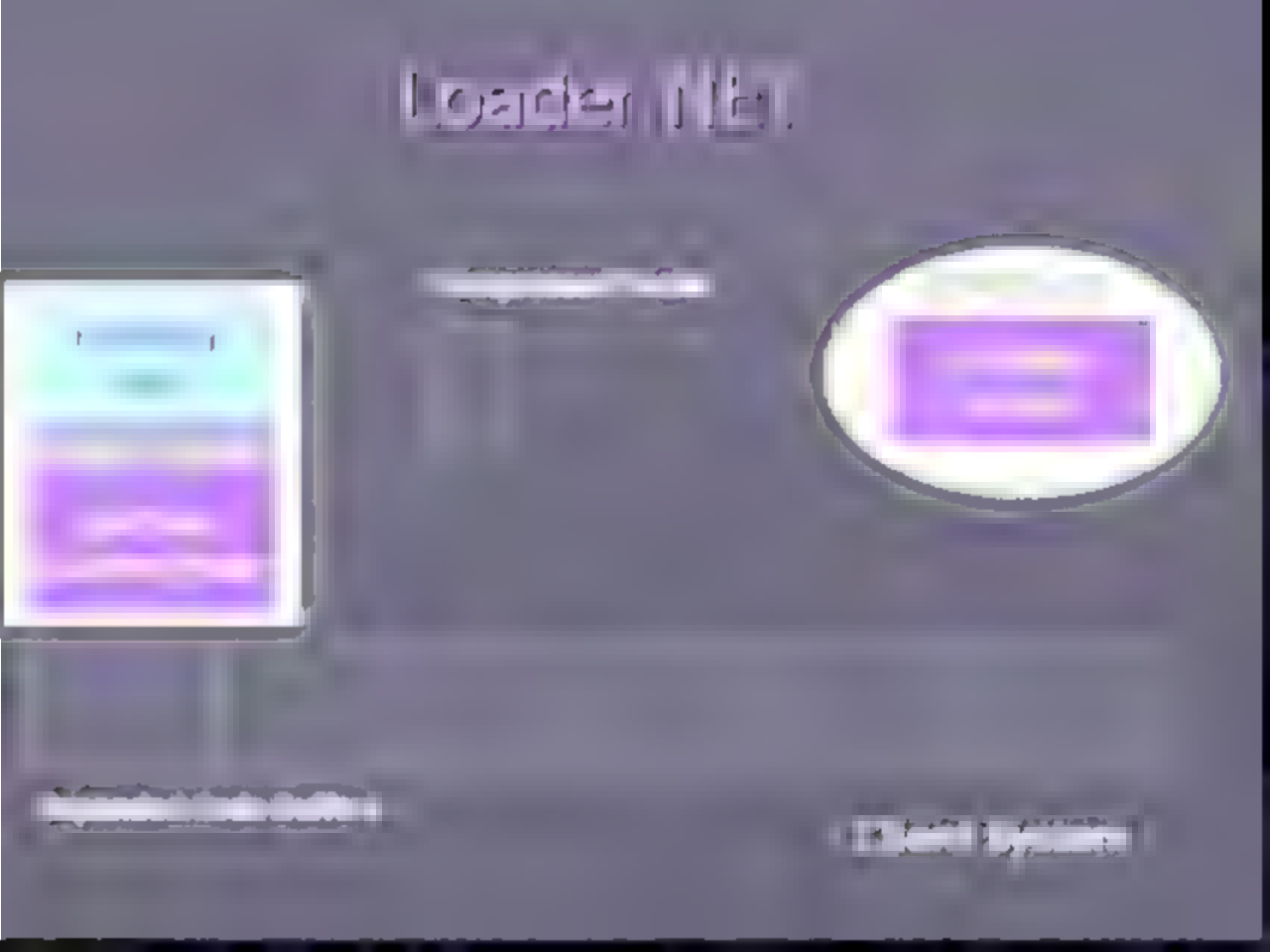
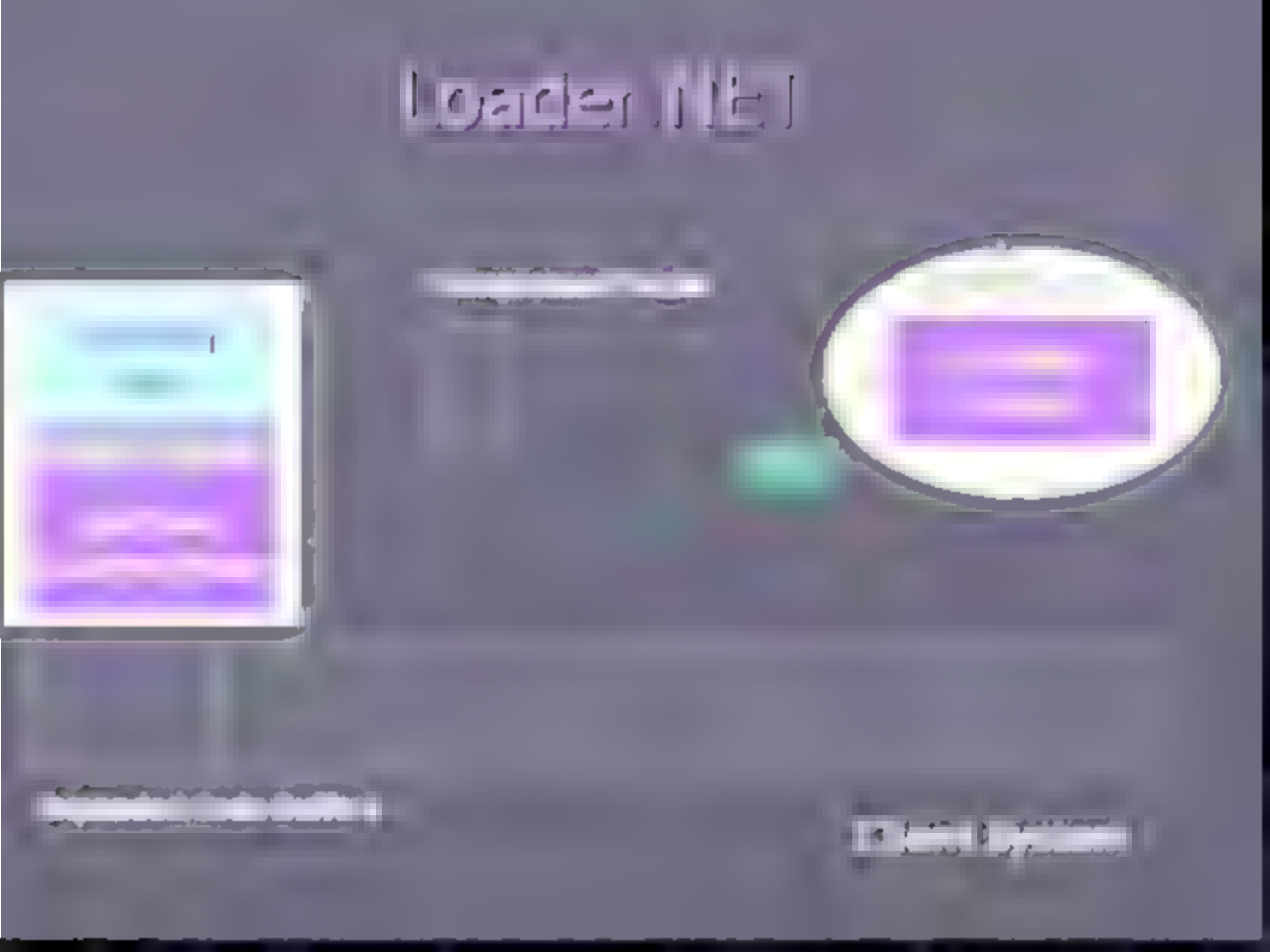
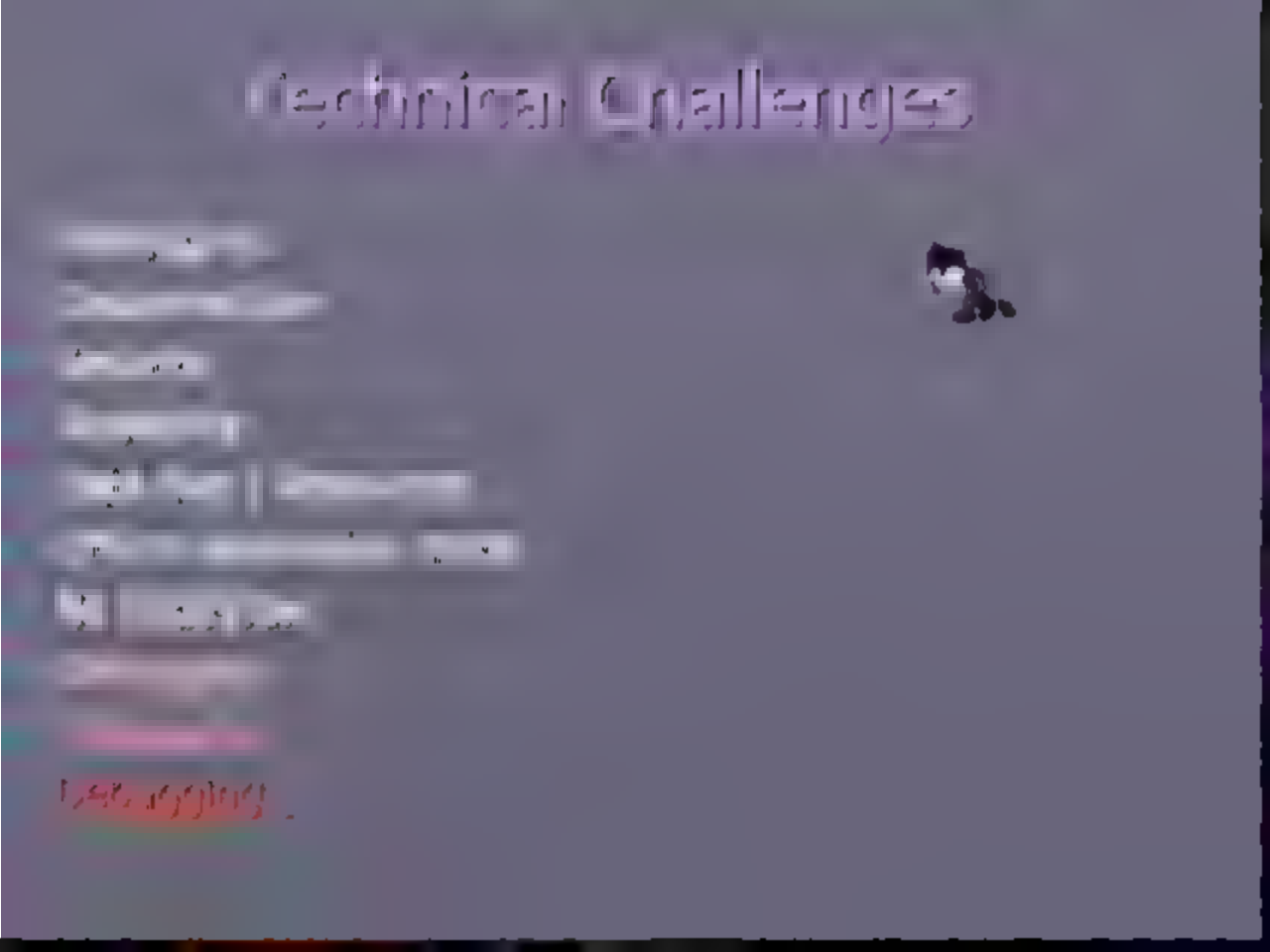
- [illegible]


Loader Net




Loader.NET

Technical Challenges



Sparse Binary Connect

Sparse Binary Coding

problem

compression ratio

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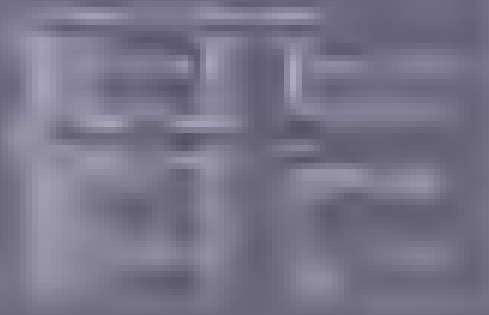

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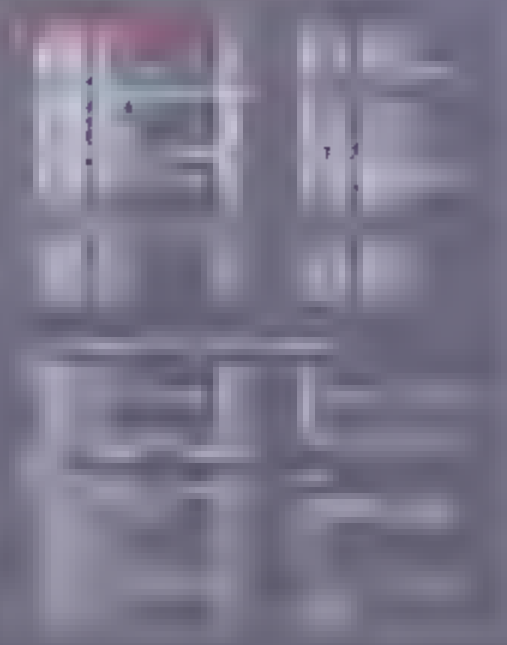

Handling Data Blocks

- Issues:
  - [illegible]
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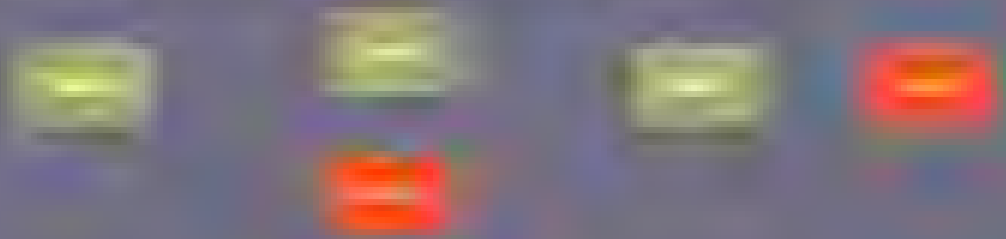

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  - Too large data arrays require special handling
  - Special PE data blocks cannot be streamed
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Download Cache Optimization

- Use BBT profile data for static layout
- Cached funclet layout schemes:
  - Layout based on funclet loading order
  - Layout based on BBT layout order
  - Layout based on pre-computed order
- One download cache for each Loader.NET component
- Multiple processes share same download cache for the same component

Into the Future

- MSIL streaming support
  - Metadata per class
  - CLR hook for class loading and release
  - Pre-JIT binary support
- Integration into platform (i.e. Fusion)
- Offline application support
  - Drizzle mode support
- Universal download cache